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A. COTTON

TERMINAL CONNECTION FOR REMOVABLE TUBES

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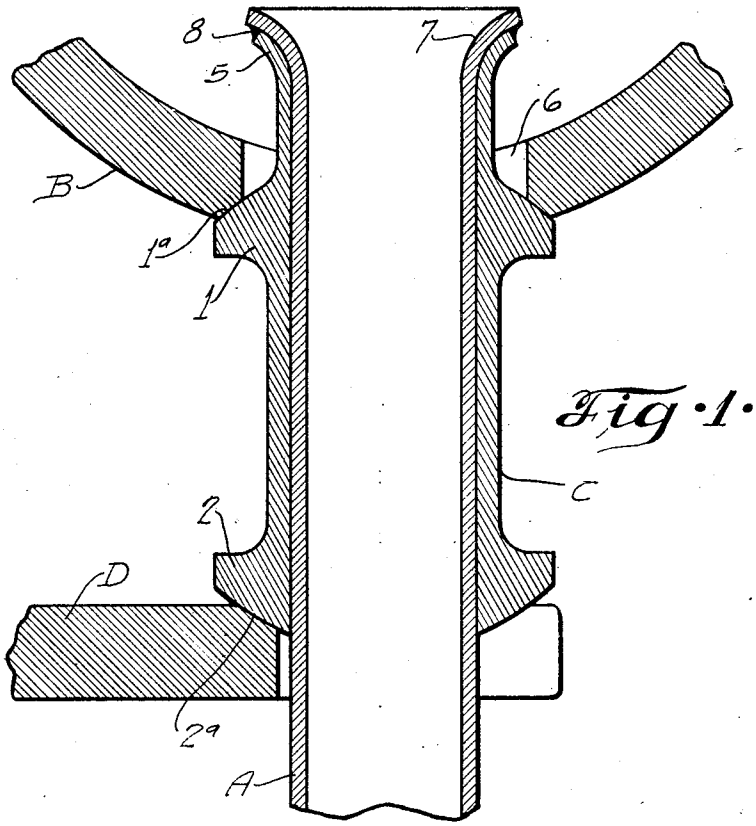


Fig. 1.

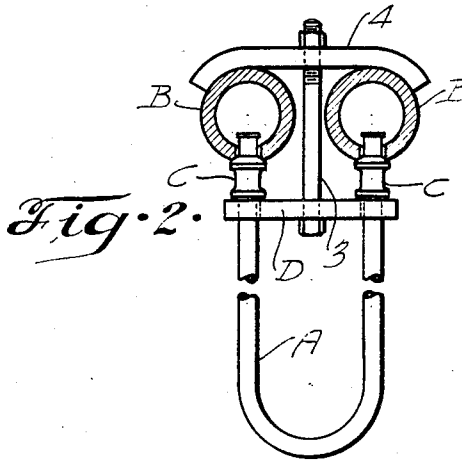


Fig. 2.

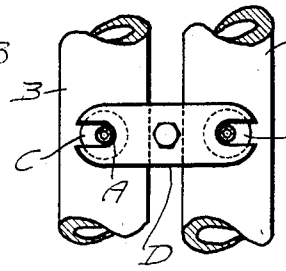


Fig. 3.

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UNITED STATES PATENT OFFICE.

ALFRED COTTON, DECEASED, LATE OF ST. LOUIS, MISSOURI, BY LAURA P. COTTON, EXECUTRIX, OF ST. LOUIS, MISSOURI, ASSIGNOR TO HEINE BOILER COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

TERMINAL CONNECTION FOR REMOVABLE TUBES.

Application filed November 22, 1924. Serial No. 751,591.

This invention relates to tubes of the kind that are detachably connected to a hollow part by means of a clamping or retaining element that bears against a laterally-projecting portion on the tube and exerts endwise pressure on the tube in a direction tending to hold a separate laterally-projecting portion on same pressed tightly against the hollow part with which the tube co-operates. The invention is applicable to various kinds of tubes, but it is particularly applicable to a tubular superheater element of the kind that is detachably connected to a header in such a way that said element can be quickly removed or applied, and after being combined with the header, is capable of a slight movement relatively to same without affecting the steam-tight joint between the superheater element and the header. Accordingly, herein is illustrated the invention embodied in a terminal connection for a superheater element and a method of producing said terminal connection.

One object of the present invention is to provide a terminal connection that is just as efficient as the terminal connections now used on tubular superheater elements, but which is cheaper to manufacture and easier to produce.

Another object is to provide a terminal connection for tubes of the general type mentioned, in which the laterally-projecting portions that bear against the clamping element and the hollow part with which the tube co-operates are both carried by a member that is separate and distinct from the tube and connected with same by a deformed portion of the tube and a welded joint.

And still another object is to provide a terminal connection for superheater elements which is of such construction that a defective superheater element can be easily replaced by a perfect element without destroying the laterally-projecting portions of the connection that bear against the clamping element and the hollow part with which the superheater element co-operates.

Figure 1 of the drawings is a vertical sectional view, illustrating the present invention.

Figure 2 is a side elevational view of a U-shaped superheater element whose legs are equipped with terminal connections constructed in accordance with the invention; and

Figure 3 is a bottom plan view of the clamping element that retains the superheater element in operative engagement with the headers with which said superheater element co-operates.

Referring to the drawings which illustrate the preferred form of the invention, A in Figure 1 designates a tube, B designates a hollow part with which the interior of said tube communicates, C designates a member connected to the tube A and provided with two laterally-projecting portions 1 and 2, and D designates a clamping element or retaining device that bears against the portion 2 on the member C and exerts endwise pressure on said member in a direction tending to hold the portion 1 thereon in snug engagement with the hollow part B. In Figure 1 the tube A consists of one of the side legs of a U-shaped superheater element and the hollow part B consists of a header to which said leg is detachably connected. In such structures it is customary to form the terminal connections on the parallel legs of the superheater element in such a manner that steam-tight joints can be easily obtained between the superheater element and the headers, even though there is a slight inaccuracy in the spacing of the side legs of the superheater element and the holes in the headers, and can be maintained in operative condition, even though there is a slight relative movement between the superheater element and the headers. Therefore, the laterally-projecting portions 1 and 2 on the member C are shown as being provided with convexed surfaces or spherical surfaces that bear against correspondingly-shaped seats 1^a and 2^a on the headers B and on the clamping element D, respectively, said clamping element D being acted upon by a bolt 3 which exerts pressure on same in a direction tending to hold the laterally-projecting portions 1 on the members C in snug engagement with the seats 1^a provided for same on the headers B. As shown in Figure 2, the bolt 3 passes through a bar 4 that is arranged transversely of the headers B in opposed relation to the clamping element D. If desired, gaskets can be arranged between the headers and the laterally-projecting portions 1 on the mem-

bers C, and washers can be arranged between the laterally-projecting portions 2 on said members and the clamping element D, but said gaskets and washers are not shown, in view of the fact that it is common practice in this art to use such washers and gaskets where desired.

One feature of the present invention consists of a terminal connection for a tube composed of a member separate and distinct from the tube and connected with same in such a manner that said member can be easily disconnected from a defective tube, and thereafter combined with another tube, said member being provided with two laterally-projecting portions, one of which bears against the hollow part with which the tube co-operates and the other bearing against a clamping element that maintains the tube in operative relationship with said part. Said member and tube can be connected together in various ways without departing from the spirit of the invention, but it is preferable to connect said parts together by deforming the end portion of the tube after it has been inserted through said member and then securing the deformed portion of the tube to said member by a welded joint. In the form of the invention herein illustrated the member C consists of a sleeve snugly surrounding the tube and provided at one end with a flared portion 5 that projects inwardly through a hole 6 in the hollow part B with which the tube co-operates, the convexed or spherical portions 1 and 2 on said sleeve being integrally connected to same. After the end portion of the tube has been inserted in the sleeve C, the end of the tube is flared by any suitable tool or means, thus producing an enlarged flared portion 7 on the tube that snugly engages the flared portion 5 of the sleeve C. The co-operating flared portions 5 and 7 on the member C and on the tube A, respectively, resist endwise movement of the tube in one direction, and in order to prevent the flared portion 7 of the tube from crumpling and pulling out of the member C, in the event the tube is subjected to an abnormal endwise strain, the flared end portion 7 of the tube is permanently connected to the flared end portion of the member C by a welded joint 8, as shown in Figure 1. The particular location of the welded joint 8 is immaterial and the flared portion 7 of the tube can be made either of slightly greater diameter than the flared portion 5 of the sleeve C so that the weld 8 can be made against the outside of the flared portion of the tube, or the flared portion of the tube can be made of slightly less diameter than the flared portion of the sleeve and the weld 8 located at the extreme end of the tube, as described in the pending application for patent filed November 22, 1924, Serial No. 751,590. The flared portion 5 on the member C acts as an abutment that co-operates with the flared portion 7 of the tube to resist endwise movement of the tube in one direction, and while it is preferable to connect said parts together by a welded joint produced by fusion welding, any other suitable means could be used for securing said parts together without departing from the spirit of the invention. It is preferable, however, to connect the tube A to the member C in the manner above described, because such a connection can be formed quickly and at a low cost, and it effectively prevents a superheater element such as the one shown in Figure 2 from being blown out of the headers with which it co-operates, because an endwise strain on the superheater element tending to force it away from the headers does not come directly on the welded joints 8, and therefore, said welds are not relied upon to resist an abnormal endwise strain. Owing to the fact that the side legs A of the superheater element are provided at their inner ends with flared portions 7 that lap over flared portions 5 on the members C, the result of the primary resistance of the welds 8 to endwise pull is to cause the flared portions 7 of the superheater element to press against the flared or curved portions 5 of the members C and to set up considerable frictional resistance to motion. Any increase in the endwise pull or strain increases this pressure and consequent frictional resistance, and thus produces an effect similar to rope wrapped around a winch barrel where a comparatively small pull in "taking in the slack" will lift a very large weight.

From the foregoing it will be seen that in the above described method of producing the terminal connections of superheater elements it is not necessary to resort to an upsetting operation or a forging operation to obtain the laterally-projecting, spherical portions on a superheater element that bear against the headers with which said element co-operates and the clamping device that retains the superheater element in operative position. On the contrary, in said method a simple flaring operation and a simple fusion welding operation suffice to securely connect the superheater element to members that surround the side legs of same, which members are provided with integral spherical or convexed portions that bear against the retaining device and the headers with which the superheater element co-operates. The convexed or spherical surfaces on the laterally-projecting portions 1 and 2 of the member C are preferably machined before said member is combined with the tube, thus simplifying the operation and reducing the cost of producing a terminal connection for a tube, and another advantage of such a terminal connection is that it permits a defective super-

heater element to be replaced by a perfect superheater element without destroying the spherical-shaped portions on the side legs of the superheater element that bear against the headers and the clamping device that retains the superheater element in operative position. In other words, a superheater element that has burned out or become defective can be easily replaced by simply grinding or filing away the welds 8, then removing the sleeves C from the defective superheater element and then arranging said sleeves in operative position on a perfect superheater element and connecting them to same by flaring the end portions of the side legs of the superheater element and connecting said flared portions to said sleeves by welds, as previously described.

Having thus described the invention, what is claimed as new and is desired to be secured by Letters Patent is:

1. A terminal connection for a removable tube, consisting of a member surrounding the tube and provided with convexed portions that are adapted to bear against concaved seats on a retaining element and on the part with which the tube co-operates, and a connection between said tube and member produced by a deformed terminal portion of the tube and a welded joint between said terminal portion and member.

2. A terminal connection for a removable tube, consisting of a member surrounding the tube and provided with portions that co-operate with a retaining element and with a hollow part to which the tube is detachably connected, a flared terminal portion on the tube that bears against a flared portion on said member, and means for preventing the flared portion of the tube from crumpling and pulling out of said member.

3. A terminal connection for a removable tube, comprising a member surrounding the tube and provided with portions that are adapted to bear against seats on a retaining element and on a part to which the tube is detachably connected, a flared portion on said member, a flared terminal portion on the tube that laps over the flared portion on said member, and a joint produced by fusion welding that connects said flared portions together.

4. In a superheater, the combination of a removable, tubular superheater element, a hollow part to which said element is detachably connected, a retaining device, a member surrounding the end portion of said superheater element and provided with convexed surfaces that seat against said hollow part and said retaining device, a flared portion on said member, and a deformed terminal portion on the superheater element, that bears against the flared portion on said member and resists endwise movement of said superheater element in one direction.

5. In a superheater, the combination of a removable, tubular superheater element, a hollow part to which said element is detachably connected, a retaining device, a member surrounding the end portion of said superheater element and provided with convexed surfaces that seat against said hollow part and said retaining device, and a flared portion at the end of said superheater element that is connected to said member by a welded joint.

6. In a superheater, the combination of a removable, tubular superheater element, a hollow part provided with a hole through which said element projects, a retaining device, a member surrounding the end portion of said superheater element and provided with portions that bear against said retaining device and said hollow part, a flared portion on said member that projects into the hole in said hollow part, and a co-operating flared portion on the inner end of the superheater element that is connected to said member by fusion welding.

LAURA P. COTTON,
Executrix de bonis non Under the Will of Alfred Cotton, Deceased.